

Serial No. 10/691,515 Page 5

REMARKS/ARGUMENTS

Claims 24-35 remain pending in the application.

Claims 1-23 have been cancelled and replaced by new claims 24-35.

Claims 24 and 35 track claims 1 and 2.

Claims 29 and 30 track claims 3 and 4.

Claims 31 and 32 track claims 6 and 8, respectively.

Claim 34 tracks claim 11.

Claim 35 tracks former claim 17.

All other claims have been deleted.

The claim objections noted by the Examiner have been attended to in the rewriting of the claims.

The problem solved by the invention

The IPv4 header includes an Internet Header Length field, which allows a router to quickly skip over any header options (also known as extension headers) to reach the payload containing the Transport header needed for Access Control List (ACL) lookups. The IPv6 header does not include the Internet Header Length field. Instead, IPv6 uses a linked list style method of adding header options to a packet. A problem arises when a long list of extension headers has to be traversed in order to reach the Transport header that contains the protocol information including the Source and Destination Ports. These delays are made worse as usually ACL lookups are based on a 5-tuple <Source IP, Destination IP, Source Port, Destination Port, Protocol>.

The invention

To solve the above problem, the invention caches information about the extension headers used within a flow in order to accelerate the handling of the packets of that flow. When a router

Serial No. 10/691,515 Page 6

receives a packet, the IPv6 header is immediately be examined. There are three different situations:

1. Packets that contain a zero flow label (do not belong to a flow), or which have no extension headers. These packets are handled using regular packet handling techniques.
2. Packets with Hop-by-Hop extension headers. These may be extracted to the slowpath for option processing, or handled in the fast path like any packet containing extension headers.
3. Packets with both flow labels (belonging to a flow) and extension headers. In this case, the router uses the information contained in the IPv6 header to perform a cache lookup, using the tuple <IPv6.srcIP, IPv6.flowLabel> as the search key.

- If no entry is found in the cache (meaning that this is the first packet of a flow) the router proceeds to traverse the list of extension headers in that packet using the IPv6.nextHeader field and the ExtensionHeader.length field. After a serial traversal, the data used to traverse the extension headers (called "extension header data" in step (a) of applicant's claim 1) is placed in the cache in anticipation of more packets in the same flow with similar extension headers.

- However, if a cached entry is found (meaning that this packet is not the first in the flow), the router uses the cached data to read the extension headers in parallel in step (b) of applicant's claim 1. With the resulting information, the router is able to quickly traverse the extension headers and either arrive at the transport header, or, in the event that not enough data was cached (meaning that the currently received packet of the flow

Serial No. 10/691,515 Page 7

has more extension headers than were cached), continue with a serial traversal of the extension headers step (c) of applicant's claim 1.

In addition, while the cache lookup is executing, the information from the header can be used to read the first extension header in the list, speeding the process even more.

Advantages of Applicant's Invention

For IPv6, many of the extension headers require no handling by routers. The invention allows these extension headers to be quickly traversed in order reach and read the transport header information. In this way, the fast-path handling of a packet is several thousand times faster than handling by the slow-path.

Also, since the transport header can be found quickly, the fields used to filter packets will not have to be changed.

Traversal of the Prior Art

The rejection of claims under 35 U.S.C. 103(a) as being unpatentable over Soirinsuo et al (US 6,084,855) (hereinafter Soirinsuo) in view of Conta et al, "A proposal for the IPv6 Flow Label" (hereinafter Conta) is respectfully traversed.

Soirinsuo modified by Conta does not solve the problem of the delays mentioned above that are solved by the present invention. Soirinsuo's solution is reflected in the abstract reading in part:

... The system identifies a number of IP flows for a plurality of connections, assigns a priority coefficient for each of the IP flows and schedules the IP flows according to the priority coefficient. The assignment of a priority coefficient results in a probability P_i that a data unit belonging to a flow carried over connection A_i will be selected for forwarding as defined by $\sigma_i * x_i / \sum (x_1 \dots x_n)$, $i = \{1, 2, \dots n\}$, where x_i is the number of flows carried over connection A_i , σ_i is the priority and n is the number of connections. The relationship between the number of flows x_i and the priority σ_i is defined by $\sum_{(i=1-n)} (\sigma_i * x_i) / \sum_{(i=1-n)} x_i = 1$.

Serial No. 10/691,515 Page 8

The section of Conta on page 26 entitled "A.3 Header Length Format" does not respond to applicant's steps (b) and (c) of claim 24 reading:

- (b) responsive to a packet containing extension headers, building a cache key for said packet and performing a cache lookup for a cache entry corresponding to said cache key; and
- (c) responsive to finding a corresponding cache entry, reading said extension headers data in parallel to arrive at and read fields in the upper-layer header.

Likewise, in applicant's claim 31, there is no element corresponding to elements ii) and iii).

Likewise, in connection with applicant's independent claim 35, there is nothing corresponding to the last two clauses of this claim.

Further and favorable reconsideration is respectfully requested.

Respectfully submitted,

Jim Zegeer

Jim Zegeer, Reg. No. 18,957
Attorney for Applicant

Suite 108
801 North Pitt Street
Alexandria, VA 22314
Telephone: 703-684-8333

Date: September 6, 2007

In the event this paper is deemed not timely filed, the applicant hereby petitions for an appropriate extension of time. The fee for this extension may be charged to Deposit Account No. 26-0090 along with any other additional fees which may be required with respect to this paper.

Serial No. 10/691,515 Page 9

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:

Signature: *Jim Zegeer*
Jim Zegeer

Date: September 6, 2007